

WHAT IS CLAIMED IS:

PCT/PTO 08 JAN 1999

non-naturally occurring

1. A mutant *C. fetus* strain useful for vaccinating an animal to *Campylobacter fetus*, wherein said strain is mutated to contain a DNA cassette encoding a heterologous protein antigen.

2. The mutant *C. fetus* strain of claim 1, wherein a *sapA* homolog is altered.

3. The mutant *C. fetus* strain of claim 1, wherein said heterologous protein is a S-layer protein.

4. The mutant *C. fetus* strain of claim 1, wherein the encoded S-layer protein represents a chimera between the native S-layer protein and the peptide encoded by the cassette.

5. The mutant *C. fetus* strain of claim 1, wherein said cassette is selected from the group consisting of *Salmonella*, *Shigella*, *Campylobacter jejuni*, *E. coli* 0157:H7, human immunodeficiency virus (HIV), simian immunodeficiency virus (SIV) and animal pathogens.

6. The mutant *C. fetus* strain of claim 1, wherein said cassette contains a 5' binding region and 3' secretion signal region and wherein said protein is inserted between said binding region and said signal region.

7. The mutant *C. fetus* strain of claim 1, wherein said cassette contains a 3' secretion signal but has no binding region.

8. The mutant *C. fetus* strain of claim 1, wherein said protein is selected from the group consisting of an antigen and a therapeutic agent.

9. A method of immunizing a host to develop mucosal and systemic immune responses to an immunogen, comprising the step of administering to said host a pharmacologically effective dose of the strain of claim 1.

10. A mutant *C. fetus* strain, wherein *recA* is mutated so that no functional RecA protein is produced, the DNA rearrangements permitting *sapA* antigenic variation occur at a very low frequency and wherein said *C. fetus* strain can only produce one of the S-layer proteins encoded by one *sapA* homolog.

11. The mutant *C. fetus* strain of claim 10, wherein said strain contains a *sapA* homolog expressing a chimeric protein including a heterologous antigen.

12. A mixture of mutant *C. fetus* strains, wherein each strain includes a *sapA* chimera which is also a *recA* mutant, wherein a single *sapA* homolog is mutated to encode a different chimeric protein representing a different heterologous antigen and each mutant is also RecA-deficient due to mutation in *recA*.

13. A method of immunizing a host to develop mucosal and systemic immune responses to an immunogen, comprising the step of administering to said host a pharmacologically effective dose of the strains of claim 12.

14. A strain of bacteria modified to express *SapCDEF* genes.

15. The strain of claim 14, wherein said bacterium is *Escherichia coli*.

16. The strain of claim 14, wherein a heterologous protein is expressed as a chimeric protein composed of sequences of heterologous origin, sequences that direct the secretion of said chimeric protein to the cell surface and sequences that direct the binding of the secreted chimeric protein to the lipopolysaccharides of the bacterial cell surface via the *sapCDEF* directed type 1 secretory system.

17. A method of immunizing a host to generate immune responses to an immunogen, comprising the step of administering to said host a pharmacologically effective dose of the strain of claim 14.